

# [x-area] Sidelink Relay Enhancements

## eMBB consumer

### MIMO

- CSI enh.
- BM: [subject to R17]
- Stationary: 8Rx, overhead redux
- UL sub-band precod.
- UL 4+ layers

### DC/CA Enh.

- X-carrier HARQ: feedback & re-Tx
- Fast re-Tx split bearer
- Temporal RS PScell act
- Scalable x-carrier sch.

### XR/CG Enh.

- QoS+, x-layer opt.

### MBS

- SFN+
- QoS+ (Tput, reliab.)
- TV (ATSC3.0 ref)

## NW Topology

### Sidelink LLeMBB

- SL-U esp. <7GHz, FR2
- Low latency 1Gbps
- SL-U RedCap

### Sidelink Relay

- U2U relay
- UE scheduling UE
- mPath, mHop
- Mobility (Remote, Relay)
- Network coding

### Smart Repeaters

- Beamforming
- Interf. Mgmt (T/F DD)
- Integration (UE authorization)

## NTN Evolution

### NTN NR

- Mobility
- Regenerative arch
- HD-FDD, VoNR, MBS
- R17 leftovers

### NTN IoT

- Mobility (connected)
- R17 leftovers

### SID Spectr. sharing

- Study scenarios, target spectrum and regulation status

## Long-term explor.

### SID AI/ML integr.

- NG-RAN/AS integrat.
- DMRS ch. est., Rx noise suppress, CSI-RS overhead, CSI feedback
- (UE-based) Mobility predict., Pos. enh.
- NW functions (load balancing, radio resource planning..)

### SID AI traffic

- Traffic and arch.
- Overhead optim.

### SID >71GHz

- Spectrum charac.

## Common tech.

### [FR2] Mobility

- L1/L2 trig. CHO
- Inter-/intra-cell beam switching delay redux
- RRC DAPS HO mPanel

### System Energy

- DCI-based pwr sav mTRP and mPanel
- gNB/TRP dormancy (UE -trig. / -imposed)
- Eval. Methodology (Pwr. Cons. Models)

### POS (NR, SL, RedCap)

- cm-level (Tx + meas related to signal  $\phi$ )
- SL (-based, -assisted)
- RedCap UE
- R17 leftovers

### SID gNB Full Duplex

- Partitioning, scenarios, interf.

## Verticals

### URLLC

- DL control efficiency
- NR-U enh

### RedCap

- PA-less
- (POS)
- NO LPWA

(UAV: neutral)

eMBB	MIMO <ul style="list-style-type: none"> <li>• CSI enh.</li> <li>• BM: [subject to R17]</li> <li>• Stationary: 8Rx, overhead redux</li> <li>• UL sub-band precod.</li> <li>• UL 4+ layers</li> </ul>	DC/CA Enh. <ul style="list-style-type: none"> <li>• X-carrier HARQ: feedback &amp; re-Tx</li> <li>• Fast re-Tx split bearer</li> <li>• Temporal RS PScell act</li> <li>• Scalable x-carrier sch.</li> </ul>	Sidelink LLeMBB <ul style="list-style-type: none"> <li>• SL-U esp. &lt;7GHz, FR2</li> <li>• Low latency 1Gbps</li> <li>• SL-U RedCap</li> </ul> <b>XR/CG Enh. [SA-led]</b> <ul style="list-style-type: none"> <li>• QoS+, x-layer opt.</li> </ul>	NTN NR <ul style="list-style-type: none"> <li>• R17 leftovers</li> <li>• Mobility</li> <li>• Regenerative arch</li> <li>• VoNR, MBS, HD-FDD</li> </ul>	MBS <ul style="list-style-type: none"> <li>• SFN+</li> <li>• QoS+ (Tput, reliab.)</li> <li>• TV (ATSC3.0 ref)</li> </ul> <p style="text-align: center;"><i>(may also be seen as non-eMBB)</i></p>
Non-eMBB	URLLC <ul style="list-style-type: none"> <li>• DL control efficiency</li> <li>• NR-U enh</li> </ul>	RedCap <ul style="list-style-type: none"> <li>• PA-less</li> <li>• (POS)</li> <li>• NO LPWA</li> </ul>		NTN IoT <ul style="list-style-type: none"> <li>• R17 leftovers</li> <li>• Mobility (connected)</li> </ul>	(UAV: neutral)
X-areas New areas	System Energy <ul style="list-style-type: none"> <li>• DCI-based pwr sav mTRP and mPanel</li> <li>• gNB/TRP dormancy (UE -trig. / -imposed)</li> <li>• Eval. Methodology (Pwr. Cons. Models)</li> </ul>	▶	Sidelink Relay <ul style="list-style-type: none"> <li>• U2U relay</li> <li>• UE scheduling UE</li> <li>• mPath, mHop</li> <li>• Mobility (Remote, Relay)</li> <li>• Network coding</li> </ul>	POS (NR, SL, RedCap) <ul style="list-style-type: none"> <li>• cm-level (Tx + meas related to signal <math>\phi</math>)</li> <li>• SL (-based, -assisted)</li> <li>• RedCap UE</li> <li>• R17 leftovers</li> </ul>	<b>SID</b> NTN f sharing <ul style="list-style-type: none"> <li>• Study scenarios, target spectrum and regulation status</li> </ul>
	[FR2] Mobility <ul style="list-style-type: none"> <li>• L1/L2 trig. CHO</li> <li>• Inter-/intra-cell beam switching delay redux</li> <li>• RRC DAPS HO mPanel</li> </ul>	▶	Smart Repeaters <ul style="list-style-type: none"> <li>• Beamforming</li> <li>• Interf. Mgmt (T/F DD)</li> <li>• Integration (UE authorization)</li> </ul>		<b>SID</b> gNB Full Duplex <ul style="list-style-type: none"> <li>• Partitioning, scenarios, interf.</li> </ul>
					<b>SID</b> AI/ML integr. <ul style="list-style-type: none"> <li>• NG-RAN/AS integrat.</li> <li>• DMRS ch. est., Rx noise suppress, CSI-RS overhead, CSI feedback</li> <li>• (UE-based) Mobility predict., Pos. enh.</li> <li>• NW functions (load balancing, radio resource planning..)</li> </ul>
					<b>SID</b> AI traffic <ul style="list-style-type: none"> <li>• Traffic and arch.</li> <li>• Overhead optim.</li> </ul>

# Sidelink Relay Enhancements

## RAN2-led

Ensure service coverage & availability where service is to be consumed  
 Enable new service consumption models with optimal routing e.g. local gaming, local data exchange  
 Improve reliability. Full mobility support.

### Objective I: Rel-17 left-overs [RAN1, 2, 4]

1. L2 UE-to-UE Relay
2. UE scheduling other UE

NOTE: no relay-specific impact anticipated for supporting unlicensed spectrum (see SL enhancements)

### Objective II: Topology Enhancements [RAN2, 4]

1. Support for multi-hop
2. Support for multi-path (incl. PC5+PC5 and PC5+Uu)
3. Mobility of Remote UE between Relay UEs

### Objective III: Mobile Sidelink Relays e.g. vehicle-mounted relays [RAN2, 3]

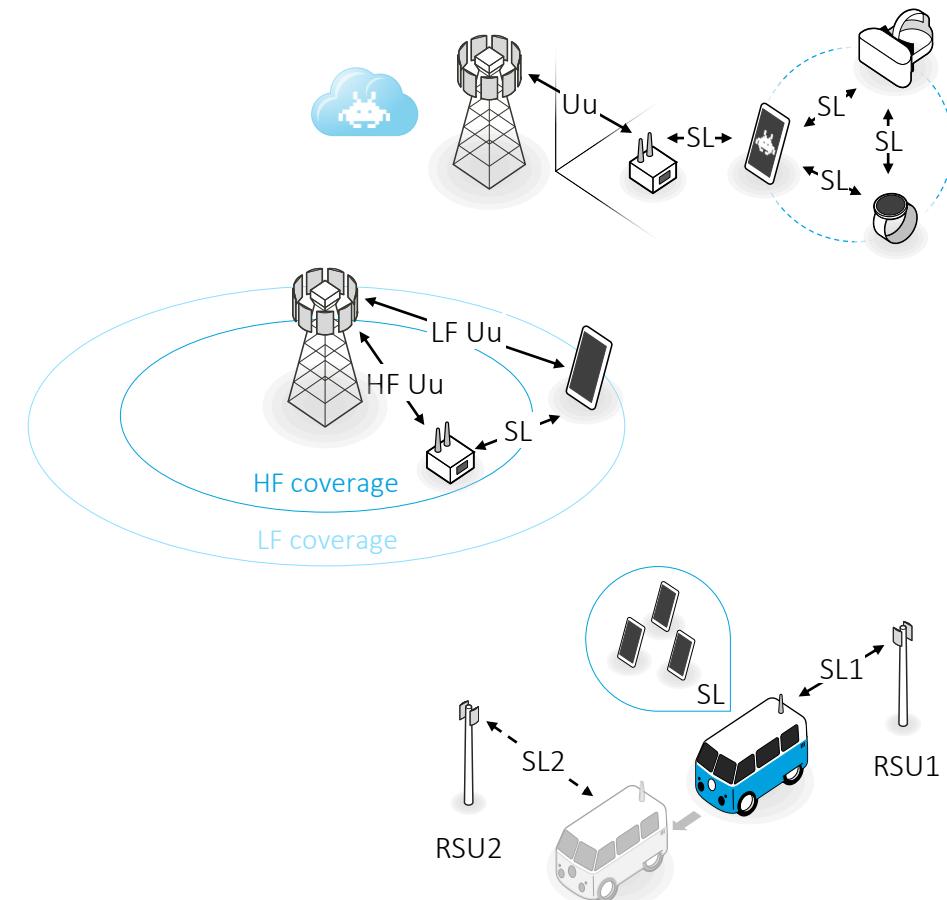
1. Group handover of Remote UEs with U2N Relay UE
2. "Resume in different cell" case for Relay UE in RRC\_INACTIVE

### Objective IV: Network Coding Transmission by Relay UE [RAN2, 4]

Relevance esp. for multi-hop/multi-path

3GPP TUs (Total w/ 9 meetings)			
RAN1	RAN2	RAN3	RAN4
6	21	3	12

SA/CT Dependency: Yes



# Sidelink Relay Enhancements

- Rel-17 leftovers
  - UE-to-UE relay: considerable interest in Rel-17, esp. for public safety use cases
    - Prioritise L2 architecture due to end-to-end security; we don't see a need for L3 UE-to-UE
  - UE scheduling other UE (discussed in Rel-16 in RAN1)
    - Clear applicability to relaying (the relay schedules its remote UEs)
    - We expect significant gains over using mode 2 for out-of-coverage UEs
- Topology enhancements
  - Multihop for deep coverage holes
  - Multipath to meet reliability requirements for demanding services (discussed in Rel-17 in RAN2)
  - Mobility of remote UE between relay UEs (discussed in Rel-17 in RAN2)
- Mobile relays
  - Group handover and “resume in different cell” case
  - These are fundamentally similar cases, requiring transfer of the relay and remote contexts between gNBs
- Network coding
  - Interesting as a reliability enhancement, especially in multihop/multipath cases

# Thank You!

# MediaTek TDocs to RAN Rel-18 Workshop

<a href="#">RWS-210092</a>	MediaTek Views on Rel-18 content	MediaTek Inc.
<a href="#">RWS-210093</a>	[eMBB] MIMO Enhancements	MediaTek Inc.
<a href="#">RWS-210094</a>	[eMBB] DC/CA Enhancements	MediaTek Inc.
<a href="#">RWS-210095</a>	[eMBB] XR/CG Enhancements	MediaTek Inc.
<a href="#">RWS-210096</a>	[eMBB/Other] MBS Enhancements	MediaTek Inc.
<a href="#">RWS-210097</a>	[eMBB] Sidelink Enhancements - LLeMBB	MediaTek Inc.
<a href="#">RWS-210100</a>	[eMBB] NTN NR Enhancements	MediaTek Inc.
<a href="#">RWS-210101</a>	[non-eMBB] NTN IoT Enhancements	MediaTek Inc.
<a href="#">RWS-210108</a>	[non-eMBB] URLLC Enhancements	MediaTek Inc.
<a href="#">RWS-210109</a>	[non-eMBB] NR RedCap Enhancements	MediaTek Inc.
<a href="#">RWS-210098</a>	[x-area] Sidelink Relay Enhancements	MediaTek Inc.
<a href="#">RWS-210099</a>	[x-area] Smart Repeaters Enhancements	MediaTek Inc.
<a href="#">RWS-210102</a>	[x-area] NTN/TN Spectrum Sharing	MediaTek Inc.
<a href="#">RWS-210103</a>	[x-area] AI/ML Integration	MediaTek Inc.
<a href="#">RWS-210104</a>	[x-area] AI/ML Traffic	MediaTek Inc.
<a href="#">RWS-210105</a>	[x-area] Mobility Enhancements	MediaTek Inc.
<a href="#">RWS-210106</a>	[x-area] System Energy Enhancements	MediaTek Inc.
<a href="#">RWS-210107</a>	[x-area] Positioning Enhancements	MediaTek Inc.
<a href="#">RWS-210197</a>	[x-area] Sub-band Full-duplex for gNB	MediaTek Inc.
<a href="#">RWS-210110</a>	Draft WID: System Energy Enhancements	MediaTek Inc.
<a href="#">RWS-210111</a>	Draft WID: Mobility Enhancements	MediaTek Inc.
<a href="#">RWS-210112</a>	Draft WID: DC/CA Enhancements	MediaTek Inc.
<a href="#">RWS-210113</a>	Draft WID: NTN IoT Evolution	MediaTek Inc.